

**MODIFICATION AND TESTING OF THE MC4043  
JETTISON CUTTER COMPONENT  
OF THE B90 WEAPON SYSTEM**

*Steven G. Hallett*

**JANUARY 1991**

**Process Development  
Weapon Systems Development  
(B90)**

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*Mason & Hanger - Silas Mason Co. Inc.*  
*Pantex Plant*

P. O. BOX 30020  
AMARILLO, TEXAS 79177  
806-477-3000

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*Marvin Thompson*  
(Name)  
*Classification Officer*  
(Title)  
*1-24-91*  
(Date)



## INTRODUCTION

The MC4043 Jettison Cutter of the B90 system is a component designed to explosively sever Kevlar straps thus disengaging the weapon from the deployed parachute. Type 6, copper precision linear-shaped charge (PLSC) has been selected as the baseline separation ordnance to perform this task. Figure 1 shows a typical example of an MC4043 test ring. Figure 2 depicts this assembly employed in a Kevlar strap separation test. Three MC4043 development assemblies have been tested in this configuration and have demonstrated the ability to satisfactorily separate the Kevlar straps. During these tests, however, it was noted that in several locations around an aluminum backing ring, residual jet penetration behind the separated Kevlar bundles was as low as 0.010 inch (Figure 3). This observation led to a concern that the jet penetration may be insufficient to reliably sever the Kevlar in all cases. These regions of low residual penetration were believed to have resulted from nonuniform PLSC jet formation since other areas of the backing ring demonstrated residual penetration in excess of 0.100 inch. For the purposes of these strap separation tests, the PLSC was mounted directly into the component steel ring as seen in Figure 4.

## DISCUSSION

Extensive experimentation at Pantex has recently identified Type 6 PLSC jet penetration performance to be dramatically influenced by the degree of confinement applied.(1) Tests suggest that low shock impedance materials may provide a better confinement environment for Type 6 PLSC than steel, especially with regard to jet penetration uniformity. This isolation apparently serves to shock decouple the PLSC from the steel ring thus reducing the probability of reflected shock interfering with jet formation processes. Computer modeling is currently underway at Sandia National Laboratories Albuquerque (SNLA) to examine this hypothesis.

Engineering development studies are also being conducted to identify confinement (tamping) materials that will potentially maximize PLSC performance while meeting all system requirements and compatibility/aging concerns. Presently, Lexan has been selected as a material that reasonably fulfills these needs. In general, the jet of a Lexan-confined segment of Type 6 PLSC will average nearly the same penetration depth as a steel confined part, but the standard deviation of the groove depth will decrease by about a factor of 4.(2) It is believed that low impedance Lexan confinement of PLSC within the MC4043 ring will significantly reduce regions of poor jet formation and consequently improve overall strap separation capability.

## EXPERIMENTAL

In order to quantitate the jet penetration depth and uniformity resulting from MC4043 experimental rings, assemblies such as the one shown in Figure 5, involving a 6061-T6 aluminum target ring, are tested. This configuration yields more complete jet penetration information about the circumference of the ring than intermittently situated Kevlar bundles. In all cases, the PLSC is initiated using low-energy, CP flying plate detonators at the specified standoff of 0.080 inch.

1. S. G. Hallett, "Assessing the Influence of Selected Variables Type 6 Precision Linear-Shaped Charge Performance," MHSMP-90-01, Mason & Hanger - Silas Mason Co., Inc., Pantex Plant, Amarillo, Texas (January 1990).
2. S. G. Hallett, Work to be published, "The Effect of Confinement on Jet Penetration Performance of Type 6 Precision Linear-Shaped Charge," MHSMP Report (1990).



























## CONCLUSIONS

Data obtained indicate that Type 6 copper PLSC performance improves significantly in terms of jet penetration uniformity when Lexan is inserted, thus isolating the PLSC from the steel ring. In addition, the mass of the ring may be reduced by replacing steel with the less dense Lexan insert without apparent sacrifice of structural integrity. It is believed that MC4043 rings can be modified to accept Lexan inserts within the bounds of current design specifications; no structural reinforcement of ring is necessary for this purpose.

